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A method for managing a catalyst installed in a flue gas NO_x removal apparatus employed in a thermal power station

Abstract

A method for managing a catalyst installed in a flue gas NO_x removal apparatus employed in a thermal power station,

the flue gas NO_x removal apparatus employing ammonia added to a discharge gas flowing on the upstream side of a plurality of catalyst layers, a plurality of discharge gas measurement holes being provided between layers of the catalyst layers and at predetermined intervals in the direction of the discharge gas flow, characterized in that the method comprises

determining, at predetermined time intervals, NO_x concentration and unreacted NH_3 concentration for respective

catalyst layers by means of measurement apparatuses inserted through the measurement holes, and

calculating percent NO_x removal and percent contribution of each catalyst layer from the determined NO_x concentration, whereby (1) monitoring a performance deterioration status of each catalyst and (2) specifying a performance deteriorated catalyst are performed.

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[Document Name] Description

[Title of the Invention] The catalyst method of administration of thermal power plant exhaust gas denitrizer

[Claim(s)]

[Claim 1] In the exhaust gas denitrizer which adds two or more ammonia to the upper stream side exhaust gas of a catalyst bed It is NOx by the measuring instrument which arranged two or more exhaust gas measurement holes in the direction of the flow of this exhaust gas among two or more catalyst beds through the interval, and was inserted from the above-mentioned measurement hole about each layer of these two or more catalyst beds. Concentration and unreacted NH3 Concentration is measured periodically. NOx By computing the NOx removal efficiency and the burden rate of each catalyst bed from concentration, it is (1). Surveillance (2) of the degradation situation of a catalyst The catalyst method of administration of the thermal power plant exhaust gas denitrizer characterized by specifying the catalyst to which the performance fell.

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention is exhaust gas of the large-sized boiler used for thermal power generation to NOx. It is related with the catalyst method of administration of the exhaust gas denitrizer which carries out decomposition processing by dry type ammonia contact selection reductionism (catalytic action).

[0002]

[Description of the Prior Art] following the NOx removal equipment of the KYUSHU ELECTRIC POWER CO. INC. harbor plant on coal ****-ization -- Showa 58(1983) April -- the 1- [the catalyst bed of the 3rd layer was installed and] The catalyst was ****ed as A layer (former dummy layer) and the 4th layer after that in Showa 60(1985) July as a measure against an air preheating machine blockade (unreacted NH3 measure against reduction), the 1st layer catalyst was exchanged in Showa 61(1986) December, and it has continued up to now (refer to drawing 1).

[0003] although managed as performance management of a catalyst at the beginning by the gas determination (NOx concentration and unreacted NH3 concentration) of only the entrance (two places) of NOx removal equipment -- so much -- coming out -- the repair or improvement with a catalyst exact timely which cannot grasp the fall of the catalyst performance of each catalyst bed is difficult -- etc. -- there was a problem.

[0004]

[Problem to be solved by the invention] The key factor to which NOx removal efficiency is reduced this invention Breakage of the adhesion (2) catalyst of the coal ash to (1) catalyst surface, An example is taken by it being what is depended on the aged deterioration (poison of the catalyst by Na, K, etc.) of the lack (3) catalyst itself, and it is NOx about each layer of two or more catalyst beds. Concentration and unreacted NH3 Concentration is measured. NOx From concentration, by computing the NOx removal efficiency for a catalyst each layer, management of catalyst performance is strengthened and it aims at measuring reproduction of catalyst performance, and extension of a period of earning life.

[0005]

[Means for solving problem] In the exhaust gas denitrizer with which this invention adds ammonia to the upper stream side exhaust gas of two or more catalyst beds in order to attain the above-mentioned purpose It is NOx by the measuring instrument which arranged two or more exhaust gas measurement holes in the direction of the flow of this exhaust gas among two or more catalyst beds through the interval, and was inserted from the above-mentioned measurement hole about each layer of these two or more catalyst beds. Concentration and unreacted NH3 Concentration is measured periodically. NOx By computing the NOx removal efficiency and the burden rate of each catalyst bed from concentration, it is (1). Surveillance (2) of the degradation situation of a catalyst It is constituted by the catalyst method of administration of the thermal power plant exhaust gas denitrizer characterized by specifying the catalyst to which the performance fell.

[0006]

[Function] If ammonia is added to boiler exhaust gas and two or more catalyst beds are passed as shown in drawing 1, the next reaction will be performed, and it is NOx in exhaust gas. It is decomposed into nitrogen and water.

[0007] 4NO+4NH3+O2 ->4N2+6H2 O2NO2+4NH3+O2 ->3N2+6H2 O -- in this case Coal ash (detailed granular material) is contained in boiler exhaust gas, this detailed granular material accumulates on each catalyst bed A and the surface of 1, 2, 3, and 4, and each catalyst bed A and the catalyst performance of 1, 2, 3, and 4 fall by breakage lack, aged deterioration, etc. of a catalyst as mentioned above. Therefore, in the interval t between each catalyst bed, it is NOx. Concentration and unreacted NH3 Concentration is measured periodically and it is NOx. From concentration, the catalyst bed to which the fall situation of performance was supervised and the performance fell can be specified by computing each layer A, the NOx removal efficiency (%) of 1, 2, 3, and 4, and a burden rate (%).

[0008]

[Working example] It connects with a chimney 8 and the exhaust gas duct 6 connected to the combustion furnace 7 of a boiler as shown in drawing 4 interposes the NOx removal catalyst layer accommodation room 9 in this duct 6. And the opening of the ammonia feed pipe 10 is carried out to the upper stream side of this accommodation room 9 into a duct 6, and ammonia is added. As shown in drawing 1 at the above-mentioned accommodation room 9, two or more catalyst beds A, 1, 2, 3 and 4, and the gas determination hole 12 of plurality (five pieces) are arranged in two or more steps through an interval t, and two or more catalyst beds are formed. It is NOx by the gas determination machine inserted from the above-mentioned gas determination hole 12. Concentration and unreacted NH3 Concentration is measured periodically. NOx From concentration, the catalyst to which the fall situation of performance was supervised and the performance fell can be specified by computing periodically each catalyst bed A, the NOx removal efficiency (%) of 1, 2, 3, and 4, and a burden rate (%). It is NOx removal efficiency and unreacted NH3 by removing them outside the catalyst accommodation room 9 by processing of EYA revving up etc. about the catalyst bed to which the performance is falling by adhesion of the above-mentioned coal ash (detailed granular material). It is improvable.

[0009] (Measurement result) In each exhaust gas measurement hole of NOx removal equipment (catalyst) which cleaned beforehand in order to verify with the system the

specification of a catalyst to which the surveillance of the fall situation of performance and the performance fell, it is NOx. Concentration and unreacted NH3 Concentration is measured and it is NOx. From concentration, the NOx removal efficiency and the burden rate of each catalyst bed were computed.

[0010] (1) As shown in drawing 2, the gas upper stream side is high, and as for the NOx removal efficiency of each catalyst bed of catalyst bed NOx-removal-efficiency each immediately after NOx removal equipment cleaning, it is shown as the gas upper stream side that a denitrogenization reaction progresses.

[0011] (2) About the NOx removal efficiency of each catalyst bed burden rate each layer immediately after NOx removal equipment cleaning, the class denitrogenization burden rate at the time of making comprehensive NOx removal efficiency into 100% is shown in drawing 2. From now on, it has paid 30% by the catalyst bed 1 50% by the catalyst bed A, and two catalyst beds A by the side of the gas upper stream and 1 show about 80% of denitrogenization effect.

[0012] (3) Unreacted NH3 immediately after NOx removal equipment cleaning NH3 (unreacted NH3) of the exit of catalyst beds 2, 3, and 4 are falling one by one with 4.4 ppm, 1.8 ppm, and 0.6 ppm, respectively, as shown in drawing 2. Unreacted NH3 of the last catalyst bed 4 It is carrying out clear [of the limit value (3 ppm) for preventing the blockade of the air preheating machine currently installed after NOx removal equipment].

[0013] (4) The NOx removal efficiency of each catalyst bed NOx-removal-efficiency a. catalyst bed A one month after after NOx removal equipment cleaning, and a catalyst bed 1 As compared with immediately after cleaning, the NOx removal efficiency of the catalyst bed A and the catalyst bed 1 is falling, respectively (-> [22% of] 14%, -> [18% of] 10%), as shown in drawing 3. The catalyst to which the fall of the performance of a catalyst could be supervised and the performance fell by this can be specified. b. NOx removal efficiency of a catalyst bed 2 Since the NOx removal efficiency of the catalyst bed A and the catalyst bed 1 fell, it is NOx with high concentration to a catalyst bed 2. It flows and the NOx removal efficiency of the catalyst bed 2 is high. c. NOx removal efficiency of a catalyst bed 3 and a catalyst bed 4 There is no change in particular.

[0014] (5) Each catalyst bed burden **** catalyst bed burden rate for one month is shown in drawing 3 after NOx removal equipment cleaning. Since the NOx removal efficiency of the catalyst bed A and the catalyst bed 1 fell from now on, it is NOx with high concentration. It flows into a catalyst bed 2, the denitrogenization reaction of a catalyst bed 2 increases, and the burden rate of a catalyst bed 2 is increasing sharply with 11 to 44% as compared with immediately after cleaning.

[0015] (6) Unreacted NH3 one month after after NOx removal equipment cleaning Unreacted NH3 of the exit of catalyst beds 2, 3, and 4 As shown in drawing 3, it is falling one by one with 5.4 ppm, 2.9 ppm, and 1.3 ppm, respectively. Unreacted NH3 of the last catalyst bed 4 Although it is carrying out clear [of the limit value (3 ppm) for preventing the blockade of an air preheating machine], compared with immediately after NOx removal equipment cleaning, it is increasing a little. This originates in the performance of catalyst beds 1 and 2 having fallen.

[0016] [what / is depended on coal ash adhesion among the catalyst beds as which the fall of performance was specified] About the catalyst exchange by fixed repair, and the aged deterioration (poison of the catalyst by Na, K, etc.) of the catalyst itself, measures, such as establishment (reproduction of a catalyst) of the removal technology of the quality of a toxic substance, can be considered [what / is depended on EYA revving up and breakage lack of a catalyst]. In addition, 11 of drawing 1 is a ******** collection hopper, and 12 is a gas determination hole.

[0017]

[Effect of the Invention] It is (1) by this invention. Surveillance (2) of the degradation situation of a catalyst Since specification of the catalyst to which the performance fell was completed, reproduction of catalyst performance and extension of the period of earning life were attained by processing of EYA revving up of the catalyst bed concerned etc.

[Brief Description of the Drawings]

[Drawing 1] (**) Figures are the side view of an arrangement state of two or more catalyst beds of this invention, and (**). A figure is (**). Exhaust gas measurement hole of this invention in a figure (Ha), A figure is (b). It is the conventional exhaust gas measurement hole in a figure.

[Drawing 2] The NOx removal efficiency, the burden rate, and unreacted NH3 of each catalyst bed immediately after cleaning It is a concentration figure.

[Drawing 3] The NOx removal efficiency, the burden rate, and unreacted NH3 of each catalyst bed one month after after cleaning It is a concentration figure.

[Drawing 4] It is the explanation perspective view of exhaust gas denitrizer.

[Explanations of letters or numerals] 6 Exhaust Gas Duct 7 Boiler Combustion Furnace 8 Chimney 9 NOx Removal Catalyst Layer Accommodation Room 10 Ammonia Feed Pipe

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[Translation done.]